NOAA FISHERIES
NATIONAL MARINE FISHERIES SERVICE

Authorizations and Permits for Protected Species (APPS)

File #: 13846
Title: Behavior, social organization and communicati
Modification: 1

Applicant Information

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Project Information

File Number: 13846

Application Status: **Application Complete**

Project Title: Behavior, social organization and communication in humpback and gray whales in Hawaii, Alaska and Washington

Project Status: Renewal

Previous Federal or State Permit: 753-1599-01

Permit Requested:
- MMPA/ESA Research/Enhancement permit

Where will activities occur?
US Locations including offshore waters
Washington (including Columbia River and offshore waters)

Research Timeframe: **Start:** 07/14/2010 **End:** 07/31/2015

Sampling Season/Project Duration: The project is 5 years in duration. In Hawaii, the sampling season is from November 1 - May 15. During the peak season (Dec 15 - Apr 15) sampling is daily. In Alaska and Washington the sampling season is primarily summer (May 15 - Oct 30), however some sampling may occur throughout the year. During field sessions that may be a month or two long sampling may be daily; otherwise sampling may be weekly or monthly. This research has been ongoing since 1996 (with its beginnings in the early 1980s), and I expect the program to continue into the foreseeable future.

Abstract: The purpose of this research is to contribute to our understanding of the social organization, behavior and communication of whales. The target species are humpback whales (Megaptera novaeangliae) and gray whales (Eschrichtius robustus). My studies involve the potential taking of humpbacks by harassment and harassment sampling and grays by harassment. These takes would occur during photo-identification, sound recording, observation (vessel, underwater and aerial) (total 5000 takes annually), and photogrammetry(300 takes), biopsy sampling (300 takes), playback experiments (300 takes) and suction-cup and implant tagging (20 takes). Non-target species could include dolphins (spinners, spotted, bottlenose, false killer whales) that, on occasion, swim with humpbacks in Hawaii, or killer whales and sea lions that may interact with gray or humpback whales in Pacific Northwest or Alaska. Inadvertent harassment during course of research is less than 500 per year. This work will be conducted in Hawaii (primarily off west Maui), and along coastlines of Washington and Alaska. The requested duration of the permit is five years. This is a renewal of a permit with no changes in research activities from previous permits.

Project Description

Purpose: The overall objective of this research is to contribute to our understanding of the natural behavior, social organization and communication patterns of humpback and gray whales.

The research has both conservation/management and academic significance. It will contribute to our understanding of the social (and communication) requirements of healthy populations and in turn indicate how human activities, from pollution to whaling, may impact these. On an academic level this research will contribute to understanding of how mammalian social and communication systems have evolved and adapted to the ocean environment.

Humpback Whales:

This is an ongoing research program (conducted with last two permits since 1996) investigating different aspects of social organization and behavior. Currently two specific studies are underway on breeding grounds in Hawaii, and both have connections to behavior on feeding grounds in Alaska.

1. The Function of the Humpback Whale Song. The current hypothesis being investigated is that the song organizes males during the breeding season (which begins in Fall on the feeding grounds), and song/singer behavior determines whether males compete or cooperate with each other around estrus females.

The objective is to determine the function of the humpback song.

2. Female Behavior on the Breeding Grounds. The general hypothesis being investigated is that females change their overall social behavior between feeding and breeding seasons. More specifically, currently we are investigating the hypothesis that females change behavior around males depending on reproductive stage, from avoidance and deterrence, to accessibility and encouragement and this governs much of the behavior of humpbacks on the breeding grounds.

The objective is to what natural factors impact and change female behavior on the breeding grounds. This knowledge is critical to understand how human activities may change their behavior.

Alaska Connections

Aspects of both of these studies overflow onto the feeding grounds (in this case Alaska). Males begin to sing in Fall on the feeding grounds and, we suspect this begins the organization of these animals for the breeding season. The change in male behavior and organization from feeding mode to breeding mode will be a key to understanding the song. Also, comparison of female behavior and relationships (with both males and other females) between feeding and breeding seasons will be critical to fully understand their reproductive strategies.

Justification

Knowledge of the social organization and mating systems of humpback whales, including the critical communication systems within and between the sexes, is very limited. This humpback whale population is growing rapidly (with a 5-fold increase since 1980) meaning an increase in interactions with human activities throughout the whales' range. It is also likely that they will be taken off endangered lists in near future opening up the possibility of renewed whaling in some parts of their range. Knowledge of humpback social organization and communication is critical to meaningful management of both non-lethal and lethal interactions with humans.

All of the proposed research builds on studies (both ours and others) that have been conducted
since the mid-1970s and are slowing revealing the life history and behavior of this species. There is no duplication of past research. Please see project description and literature review to see how the proposed research builds on past work, both our own and in the field overall.

Gray Whales and Humpback Whales in British Columbia/ Pacific Northwest

Grays

Since 1975, I have been studying aspects of population biology, behavior and ecology of a gray population that spends the summer off the west coast of Vancouver Island. Individuals in this population (that we have tracked for over 30 years) regularly range into Washington State waters.

The purpose of including the request to photo-identify gray whales throughout the Pacific Northwest is to allow me to track the "Vancouver Island" whales as they range beyond Canadian waters. This is likely to occur only under special circumstances: 1) the whales do not return to BC waters in one summer (I would like to know where they are); and 2) if whales tagged in BC waters roam into US waters I would like to be able to follow them.

Since the mid-1980s I have been surveying and photo-identifying humpback whales that feed off the west coast of Vancouver Island. Since the mid-1990s the numbers in both offshore and inshore waters have increased dramatically. These humpbacks straddle the Canadian/US boarder in Straits of Juan De Fuca between Vancouver Island and Olympic Peninsula and Haro Straits between Victoria, BC and San Juan Island WA. Should we find ourselves straying over the boarder during photo-identification surveys I would like to be covered by the permit.

I have no plans to base studies of either gray of humpback whales in Pacific Northwest US waters, but as the whales that I am studying in Canada range across the international boarder I would like a permit to follow them should it be necessary for the research project.

Description: Project Description

There are two projects described in this permit application: 1) The primary project is humpback whale social organization and behavior in Hawaii and Alaska; and 2) the second project is on gray and humpback whale abundance and behavior in the Pacific Northwest.

For the primary project on humpback whales in Hawaii and Alaska an array or research techniques are described in this application. This is an ongoing project investigating social organization and behavior in humpback whales (with its beginnings in the early1980s and continuous since 1996). This research uses a variety of field techniques developed over last 30 years, all tried and true, to investigate the behavior of whales in their natural habitat.

The second project on grays and humpback whales in the Pacific Northwest relates entirely to studies based in Canada where the individual study animals may range into US waters, and hence require permit to approach them. In this case the request is for photo-identification/observation only.

It should be noted that none of the techniques used in this research are new or experimental. That is, all have been used for a number of years on a variety of cetacean species worldwide, with impacts negligible, and have been allowed under my previous permits

Types of Taking: number of individuals, species, sex, age class, and manner

General

Humpback whales may be 'taken by harassment' during photo-identification, observation, biopsy sampling, sound playback experiments, and tagging.

Our studies involve documentation of individual animals through photo-identification, then - depending on specific objective of the day - they may be observed on surface, underwater and from air, measured through photogrammetry, and biopsy sampled to determine sex and genetic relationships. Our studies may also involve sound playback experiments and tagging.

Gray whales may be 'taken' by photo-identification and observation.

Photo-identification

I estimate a maximum of 5000 humpback whales could potentially be 'taken by harassment' through photo-identification and observation annually. Both sexes and all age classes will be subject to photo-identification and observation.

How the number is estimated:

In Hawaii the studies include focal follows of individuals that involve photo-identification then the tracking of these individuals and the other whales they interact with, for hours. The subject whale may interact with dozens of other whales through the observation period as it moves from one social group to another. This means that we may, through identification of the subject whale and the whales it interacts with through the course of a day, potentially "take by harassment" as many as 50 whales a day. If this occurred over a 50-day field season then 2500 whales could potentially be taken.

In Alaska feeding groups of more than 100 whales can occur and even basic photo-identification of these animals may involve takes. If one could theoretically encounter an average of 50 whales a day over a 30-day field season a maximum of 1500 whales could be taken.

See "Observation' below to see why extra 1000 whales are added to these figures to equal 5000

(NOTE: these are maximum theoretical numbers – in reality the number 'taken' is far smaller.)

Observation

The behavior studies require close observation from surface, underwater and from the air. Surface and underwater observation would follow photo-identification, therefore numbers would not increase over those estimated for ID. However, aerial work may involve whales not photo-identified (see description section below) therefore increasing the number of whales potentially taken by harassment.

Due to this possibility I will add 1000 whales to the number potentially taken by harassment annually. In Hawaii, during peak season one could potentially fly over 100s of whales in one hour.

Aerial observation may be from plane or helicopter. The vast majority of the work in done above 750 feet, however under specific circumstances we may dip below that height so I request clearance to 500 ft. above the animals.

It is critical to note here that the harassment of the animals through observation is theoretical. Any human-caused change in behavior during studies of natural behavior negates the observations/trial therefore we go to great

lengths not to disturb, i.e. 'take' the whales.

Photogrammetry

I estimate a maximum of 200 whales would be measured annually.

The whales are measured at the time they are photo-identified, so these are not additional whales beyond the 5000 total. The photogrammetry techniques require a minimum of three measurements per whale, therefore the potential takes per animal increase.

Biopsy Sampling

I estimate a maximum of 300 humpbacks will be taken by biopsy sampling annually.

The biopsy sampling in Hawaii is used strategically, that is when we need to know the sex or possible relationship of individual whales involved in specific behavior patterns. Less than 150 whales would be biopsy sampled during the season in Hawaii.

In Alaska This study requires samples of whales within specific social groups or whales which are associated with each other by location (which may range up to 20 whales), as well as from the general population for comparison purposes. Supposing three main groupings are sampled (at 20 per group hence 60 whales), and a equal number are sampled from the "general" population then 120 samples would be taken. I estimate the numbers biopsy sampled will be less than 150 per year.

Playback Experiments

Playback experiments will involve the take of a maximum of 300 whales per season. The sample size required is 20 high quality playback trials. If the subjects are lone males then 20 whales will be directly involed; when the subjects are females (they may be accompanied by a male escort and/or a calf) so as many as 60 whales may be the subject of 20 playbacks. If both studies are underway in same year then a total of 80 whales may be direct subjects of playback.

In addition, the playback broadcast is here for several km in all directions and may well inadvertently be heard by other whales. Part of the experimental protocol is wait until the subject area is clear of non-target whales (reason is the surrounding whales are likely to affect the behavior of the subject). However, it is not possible to be sure all non-target whales are out of hearing range therefore I have estimated another 220 whales may be 'harassed' by the playback over the season.

Tagging

A maximum of 20 adult whales will be taken by tagging each season. I divide these into 10 suction cup tags and 10 implanted tags, as the use of the tags varies depending on the specific behavioral question addressed.

As it is possible that attachment will not be successful on all attempts; an individual whale will not be approached for tagging more than three times. That is, if the attachment has not been successful by then, the whale will be left alone. There is no intention to take individual animals more than once.

Animals Taken in More Than one Manner

Whereas the vast majority of the animals 'harassed' will be taken only by observation and photo-ID, some specific animals (<1000)will be taken in more than one manner. It is this latter group that is most valuable to behavioral research. That is, for example, if a whale is to be subject of behavioral observation or playback experiment it is valuable to know its ID (and sightings history) sex (biopsy) and age class (photogrammetry).

Photogrammetry

Measurement can be accomplished at same time as photo-ID so the whale is not taken in more than one manner.

Biopsy

A maximum of 300 whales will be approached, photo-identified and biopsy sampled per year.

Playback Experiments

A maximum of 300 whales will be approached/observed, photo-identified and subject to playback experiments per year.

Tagging

A maximum of 20 whales will be approached, photo-identified and tagged per year.

It is possible that a small subset of animals could be subject of all the techniques in one year. That is it could be photo-identified, measured, biopsy sampled, in a playback experiment and tagged. Although the odds of this occurring solely to due realities of field research on whales are very low, I would like to include the possibility in my takes. A maximum of 20 whales would be subject to all the techniques.

Individuals Taken More Than Once

Individuals are likely to be taken more than once in the following situations.

Photo-identification: An individual is approached (within 100m) for photo-ID; up to 3 takes per close approach may occur per animal per day for 100 days per year.

Observation: An individual is approached (within 50 m) for observation: up to 3 takes per close approach may occur per animal per day for 100 days per year.

Photogrammetry: An individual is approached (within 20 m) for photogrammetry: up to 3 takes per close approach may occur per animal per day for 50 days per year.

Biopsy: An individual is approached (within 20 m) for biopsy sampling: up to 3 takes per close approach may occur per animal per day for 50 days per year. Whales will not be intentionally sampled more than once.

Playback Experiment: An individual is subject of a playback experiment: up to 2 takes per day for 30 days per year

Tagging: An individual is approached (within 10 m) for tagging: up to 3 takes per close approach may occur per animal per day for 20 days per year.

DETAILED METHODS

Photo-identification

Photo-identification, that is the identification and repeat sightings of individuals, is the fundamental technique used to study wild whales. It is the basis all behavior studies and most abundance studies, all over the world, and has been so for 30 years.

Photo-identification of humpback whales is done by photograph of the underside of the tail flukes.

The platforms used in this research are small craft, boats ranging from 5m to 20 m.

Whale are approached from behind (to within 30 -100m) and a photograph is taken of the underside of the tail as the whale dives

Photo-identifications are analyzed in a variety of ways depending on the objective. All involve matching with other ID photographs to look for repeat sightings of individuals. For behavior studies the history of an individual's location, social associations and behavior are most important.

Photo-identification is also a critical first step in our photogrammetric measuring and biopsy sampling, as we wish a record of which individual is being measured, or whose sex is determined. Also focal follows or playback experiments require individual ID to insure the subject whale is the one observed throughout the sample or experiment period.

Observation

Close observation, often over extended periods, is a key to studies of behavior. This occurs from three platforms: 1) small craft; 2) underwater and; 3) air (small plane or helicopter).

From Surface/Small Craft

The small craft used are 6-8m in length. Surface observation work includes: 1) focal follows where a specific whale or social group (e.g. singer or mother with calf) is followed for set period of time (e.g. two hours) and during that time its movements, associates and behavior are documented; 2) periods of documenting behavior prior, during and after a playback experiment. The boat slowly follows the whales (at approximately30-80m) during their activities.

Underwater

The Hawaii study location/conditions provide opportunities for underwater observation. The platform is the same small craft used in surface observations. The boat approaches the whales to within 10-30 m and divers enter the water. Once the whales are in view underwater the divers do not swim towards the whales, unless specifically required to do (for example if photograph of genital area is required to confirm sex). Most the observation involves video to record the behavior of the interactions of individuals within groups (e.g. cooperation of competition of males around a female) or to document the affect of a playback experiment on a subject whale. Every effort is made to have divers NOT disturb the whales as this defeats the purpose of the study of natural behavior patterns.

Underwater observations will usually occur with a swimmer with mask and snorkel that slowly approaches to a good observation distance then remains stationary to watch the activity. We may further experiment with the use of new light re-breathers to allow silent (no bubble) observation at depth over long periods. Underwater observations will be documented by photograph or video. Underwater observation may also be made by remote camera - either extended on a stick from a boat stick, or potentially by a small remote or manned submersible.

Air

Aerial observation as is conducted from small plane or helicopter. Video is taken of interactions of individuals. Current focus is on behavior and interactions of groups of males following a female. In this case a minimum 15-minute video segment is taken for behavior analysis (analysis using Noldus behavioral software). The aerial observations are generally above 750 ft. so as to insure no disturbance of the whales. At times we find ourselves going slightly lower to confirm a specific individual or behavior (including things like injuries or entanglements), therefore would like to be permitted to fly as low as 500 ft.

Photogrammetry

We have used two photogrammetric techniques in the past, aerial photogrammetry - where a photograph of the whale is taken from helicopter and vertical distance to whale determined by altimeter; and surface photogrammetry where photograph of the whales tail is taken from a boat and distance to whale determined by laser range finder.

In both cases three measurements must be made, so the individual is approached by helicopter or boat three times for this purpose.

Due to cost, and recent studies that confirm that whale tail size correlates with whale length, all planned photogrammetry is from the boat. This requires approaching from directly behind (at a 90 degree angle from the tail) to a distance 50-80 m and taking a photograph, just as with photo-identification. The only different is that this then must be repeated 3 times per individual (as as one does not achieve a correct angle on each approach we estimate 5 approaches per individual may occur).

Analysis involves photogrammetic ratios to determine the width of the tail. This allows individuals to be placed in an age class: juvenile or adult.

Biopsy Sampling

After an approach within 50 m the sample is obtained by shooting a dart from crossbow that bounces of the whale and floats for pick up by small craft. The size of the sample is about the diameter of a pencil by one inch in length. Samples are preserved in saline preservative solution in tubes and sent to geneticist.

Playback Experiments

Sound/song playback involves the broadcast of song through an underwater speaker in the vicinity of the subject whale, and the measurement of any reaction.

This work involves the playback of whale song or social sounds. The reaction of the different subject whales (singers, lone non-singing adults, adult pairs of male and female, female with calve and male escort, and female with calf) is the key to the study.

We use a Lubell LL-9162 Underwater Acoustic Transducer, a small underwater speaker than can be lifted and hung over the side of small vessel. The objective will be to project a signal as close to the volume and quality of a real singer as is possible. The playback system will be calibrated so precise levels of sound can be projected. The source broadcast level will depend on the whales distance from the playback, but the whale will not be exposed to more than 155 db (level at the whale). The best estimate of maximum source levels from singers is about 187 dB (W. Au pers. comm. 2003). At this source level, for a conspecific about 90 ft. (two whale lengths) away the received level would be 158 dB. Singers are often that distance away from cows with calves, with no apparent disturbance (or at least no behavioral reflection of it) to the non-singers. It is not certain these levels can be achieved from a small portable playback unit – but they would be the absolute maximum received. Our playbacks will all occur from further than 100 ft from the subject.

This work will require at least two vessels: one with the playback equipment and another with the subject animal listening to the playback by hydrophone. All locations and distances will be determined by GPS. Further, the validity of this study depends on the controls that can be established around the experiment – needed to differentiate the reactions of the subject to the playback versus its reactions to surrounding whales and activities. This will be done in two ways. First, the playbacks will be conducted relatively early (Jan.) and late (Apr.) in the season when there is a reduced density of whales and activity in the region. Second, every effort will be made to document all whales in the vicinity of the subject whale at any trial. This will be accomplished with a minimum of a third vessel and hillside observer, and on a few occasions with a helicopter hovering over the experiment at

1000 ft. to determine if other whales are present in a 1 km square around the playback.

The objective of each season may be to make a maximum of 40 playback trials. Considering that some of these trials will include more than one subject whale, some trials will be aborted due to control issues (other whales entering the vicinity of subject whale, and other whales in the region inadvertently hearing the broadcast sounds this application is to take 300 whales per year during playback studies.

Tagging

We plan to use newly developed acoustic and satellite tags for investigation into short term relative movement patterns of individual whales. These tags are attached by suction cup, either by crossbow or long pole applicator, on the whale's high back posterior to the blowhole, and a corrosion release mechanism will be set for a period of hours. Attachment requires a close approach (within 10 m) where the tag is either shot onto, or manually applied via pole applicator, to the back of the animal.

Exact dimensions and weights will vary with generation of tag, and whether or not a data logger is included with the transmitter. The ongoing trend is to smaller and lighter tags. Two examples of tags successfully used on humpbacks in Hawaii in recent years: Baird et al (2000) used a combination VHF and TDR tag that weighed 400 grams, and was attached by 8 cm suction cup; Mate et al (1998) used a satellite transmitter (UHF) tag with dimensions 2.5 x 17 cm, weight of 495 grams, shot from a crossbow and attached by two subdermal barbs. Both studies report impact to the animals was minimal. The tags we are considering include an acoustic tag and satellite tag similar in size and attachment to the Baird et al (2000) tag.

Selected References for Methods

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Purpose of Each Activity

The purpose of the research activities is to measure and interpret whale behavior. Some basic information is required for any behavior study, including a marked or identified individual, its sex and age, and its interactions with other whales. All of our activities relate directly to these objectives.

Photo-identification

All behavior studies are based on identification of individual animals and either, focal follows, where the animal is observed over a sample period of time and/or repeat sightings of individuals in different locations, and social groups.

Observation

Perhaps obviously, observations are the key to studies of behavior. The challenge with whales is that since they spend vast majority of time underwater, observation can more challenging than it sounds.
Extended observations of individuals where one can actually document behavior and interactions require the use of every method available, including underwater and aerial observation and videography for later analysis.

I presume this is obvious – but for example, it is critical to see what actually occurs when a male joins a singer (agonistic or non-agonistic interaction), or the details of the interaction of a male and female during dives (courtship, mating, avoidance).

Photogrammetry

Knowledge of the age class (even when defined as generally as young/juvenile or mature) is critical to defining social organization and behavior.

For example the interpretation of behavior in a pair consisting of one adult and one juvenile will be different than a pair consisting of a mature male and female.

Biopsy

Primarily we use skin biopsy to determine/confirm the sex of whales involved in specific social behavior. For example if we wish to know the sex of an individual whale that joins a singer it will be biopsy sampled, or if want to determine the sex of a pair of whales that a singer joins, each will be biopsy sampled.

We also use behavior (e.g. if whale has a calf) and, at times, photographs of underside to determine sex, however when confirmation is required skin biopsy is the technique of choice.

Clearly knowledge of whether an individual is male or female is fundamental to interpretation of behavior patterns.

Biopsy samples also allow investigation of genetic relatedness, which may explain the consistency in composition of some social groups, and certain behavior patterns. This work in done through collaboration with a geneticist.

Playback Experiment

Playback experiments are a standard technique used to investigate the function or meaning of sound communication to the subject. As whales are primarily acoustic animals, sound playback experiments are very applicable

to studies of social organization and communication.

There are two specific uses of the playback techniques in this study:

In studying the function of the song, a playback experiment allows us to control the composition of the song. This allows investigation into whether composition is the key to the observed effect of singing of attracting other males to the singer.

The second use of playback is to determine how females in different reproductive stages react to nearby males. The playback broadcasts the sounds of nearby males, and the female's reaction measured. This contributes to understanding of female behavior on the breeding ground including short range movements, and overall reproductive strategies.

Tagging

The purpose of tagging is to increase the duration and quality of observation of individual animals – the key to studies of social relations and behavior. In Hawaii the density of whales is so great and movement so widespread repeat encounters with the same individuals are not common. One result of extended observation is it tells us what individuals animals (of different age and sex) do over time, and especially the duration of their associations with other individuals.

The information gained from the tag will depend on the type used. Even a simple radio tag will allow the location of the subject from day to day – this alone hugely increasing the ability to study the whales movements and associates. With use of the higher tech 'smart' tags 'observation' is essentially continual through data logging for the duration the tag is on the animal.

All of these techniques are a means to further understanding the function of various social groupings and behavior patterns.

Estimated Number and Type of Non-Target Species Affected

The affects of this study on non-target species are minor if not negligible for two reasons: 1) the appearance of non-target species, while it occurs, is relatively rare in study areas; 2) the non-target species are very obvious (e.g. dolphins, sea lions), and interaction with the target species short-lived. That is, it is easy to postpone any activity that may impact the non-target species until they have moved on. (The only activity that may some inadvertent impact on non-target species is playback – however one would not purposefully conduct the trial with these other species around as they may be be disturbing the subject whale.)

It is conceivable that several non-target species will be marginally affected. During playback experiments it is possible the sound could be heard by other species (e.g. dolphins, killer whales) beyond the vision of researchers. For example, one conceivable scenario is where a school of 200 dolphins swim out of sight but within hearing distance of a playback experiment. (In 5 years of doing playbacks in Hawaii to our knowledge this has not occurred but it is possible.) However, the sounds used in the playback are naturally occurring in the area so an impact would likely be minor.

With over 30 years experience in the study area waters, I will say unequivocally our studies do not affect the non-target species in any significant manner.

Sharks occasionally follow and attack research boats and researchers however the impact on shark is not negative.

Proposed Activity coincides/avoid sensitive biological periods such as reproductive seasons/maternal care of target and non-target species.

The proposed activities purposefully coincide with reproductive and feeding seasons as we are studying social organization and behavior in both situations.

The population size has increased 5-fold since these studies began in the 1980 strongly suggesting they have no significant impact on humpback reproduction.

For import and export activities

It is possible biopsy samples may be exported to geneticists that work outside the USA.

CITES permits for export and import are obtained from the US and the other country involved.

The biopsy sample is divided in two and half stored in freezer in US. The other half is exported. The samples are placed in preservative, in plastic test tube size containers, labeled and couriered to their destination.

Supplemental Information

Status of Species: Status of Affected Species

Humpbacks: ESA (endangered); MMP (depleted); CITES (Appendix 1)

Grays: MMP (delisted); CITES (Appendix 1)

Humpback Whales

Humpback whales are currently designated endangered, but it is clear that North Pacific populations are relatively healthy and recovering. The most recent North Pacific population estimate is 20,000, with about half of these visiting Hawaii (Calambokitis et. al. 2008). When compared to population estimates from Hawaii conducted since early 1980s it is apparent this population as increased 5-fold in last 30 years. Throughout the North Pacific humpback appear to be increasing in numbers and returning to traditional grounds where sub-populations were decimated during whaling. The number of humpbacks cataloged in S.E. Alaskan waters were about 850 in 1997 (Straley and Gabriele 1997). As there is no whaling on North Pacific humpbacks, with the possible exception of small numbers in Taiwan, the factors potentially affecting status are food supply or a major pollution event.

Gray whales

Eastern gray whales were taken off the endangered list in 1994, with evidence that the North American population had recovered to estimated pre-whaling levels of more than 20,000 animals (Buckland et al 1993). The sub-population of gray whales that ranges along the North American coast from California to Alaska in summer, and which are the subject of this study, numbers several hundred whales (Calambokidis et. al..2001). Makah whaling could potentiallyimpact this sub-population; otherwise food supply and pollution are the most likely factors to affect its status.

ALL REFERENCES IN 'REFERENCES' ATTACHMENT

Lethal Take: Not Applicable

Anticipated Effects on Animals: I anticipate NO significant effects from the activities, alone or cumulatively, on the behavior or physiology of the target animals. There will be short-term 'startle' responses on a portion of the animals biopsy darted, and tagged – however no studies worldwide have indicated any long-term behavioral or physiological effects from these activities.

The playback experiments are designed to change the behavior of the target animals in some trials. To date, with 20 playbacks to singers and 40 playbacks to pairs of adults – in trials where the target animals respond, they return to documented natural behavior patterns shortly after the end of the playback experiment (usually within minutes).

I anticipate NO effects on the population as a whole. All of the techniques proposed in this application have been used on this population for 30 years. In that time the population has increased 5x.

No mortalities have occurred in previous research.

Conspecifics or non-target species: This has been described in Project Description section above. There will be no significant effects.

Measures to Minimize Effects to Listed Species:

As stated, the proposed research will not cause any negative effects beyond the short term startle response of a portion of the target animals during biopsy and tagging, or short-term (minutes) behavioral change during playback (which may involve stopping singing and moving towards or away from playback). If there is any indication whatsoever that animals are being negatively effected by any of the activities they will be stopped forthwith.

There will be no negative effects on non-target species.

Important Note:

We study natural behavior patterns, therefore the key to success is NOT to disturb these patterns unless absolutely necessary to learn something considered critical to understanding the animals. If we change the behavior of the whales in anyway – we cannot use the behavioral data. So we are extremely careful.

There are three exceptions to this rule:

1) When determination of sex (or relatedness) through biopsy is deemed critical to understanding the behavior. This is done at the end of any type of behavioral observation in case the procedure disturbs them (and often it does not).

2) When tagging can gather data on movements that cannot be gathered otherwise. The whale is tagged, then followed at a distance (if suction cup tag) or remotely (if implant tag). All indications from all studies are that tagging does not change overall behavior patterns – if it did, the resulting data would be worthless scientifically.

3) In playbacks we are purposefully 'tricking' the whale into responding to a stimulus in order to understand the function and use of whale sounds. All sounds used are made by whales and occur throughout the breeding season naturally – the only difference is we are broadcasting them in a controlled manner such that reactions can be measured. We only do one playback session per animal (which may involve a maximum of 2 playbacks) lasting no more than 60 minutes – many are complete in 30 min.

There are no feasible alternative methods to collect the desired data.

One procedure that we follow that minimizes any stress effects is that we work with whales that are not otherwise being observed – either by other researchers or whale watching boats. We never approach whales that are the subject of other researchers and if a whale watching boat approaches us during any activity we either move on to other whales and start again, or pull away and wait until whale watchers leave.

Resources Needed to Accomplish Objectives:

I have been conducting these studies since 1980 in Hawaii, Alaska and the Pacific Northwest. Funding, facilities and resources are always hard to come by, however we have successfully conducted fieldwork, analyzed data, written, presented and published papers for a number of years.

The research in Hawaii and Alaska is supported by Whale Trust with its office, accommodation, boats and vehicles available to the research project (whaletrust.org),. The research in supported primarily by private funds from a variety of sources, administered through Whale Trust.

Gray whale work in Canada (and adjacent US waters) is supported by private donations through the NGO Pacific Wildlife Foundation, Vancouver. Boats, vehicles and office are available through this organization in Tofino, BC.

Disposition of Tissues:

We will collect tissue samples during biopsy sampling. Once analyzed for the purposes of this study any remaining tissue will be stored by Dr. Per Palsboll at:

Prof. Per J Palsboll
Department of Genetics, Microbiology and Toxicology
Stockholm University

106 91 Stockholm, Sweden

Remaining tissue samples will be available for other studies should requests be made to Dr Palsboll and myself.

Public Availability of Product/Publications:

The products and information resulting from this research covered by the last two permits have included availability in:

1) Peer reviewed scientific papers (e.g. Darling and Berube 2001, Darling et al. 2006)
2) Popular magazine articles (e.g. National Geographic: April 1982, July 1999, Jan, 2007)
3) Variety of TV documentaries from countries including US, Canada, UK, Japan and Germany.
4) Popular book by author (Hawaii's Humpbacks – Unveiling the Mysteries)
5) Community events where research is presented to public (e.g. Whale Quest - see whaletrust.org)

I expect all of these products will continue through the duration of the permit applied for.

Location/Take Information

Location

Research Area: Pacific Ocean **States:** AK,HI **Stream Name:** Coastal waters of S.E. Alaska and Hawaii
Location Description: Coastal waters of the main Hawaiian Islands (N21 W157); coastal waters throughout S.E. Alaska (N58 W134). Primary study area in AK within the Frederick Sound, Chatham Strait, Stephens Passage, Lynn Canal and Icy Strait areas.

Take Information

Line Ver	Species	Listing Unit/Stock	Production /Origin	Life Stage	Sex	Expected Take	Takes Per Animal	Take Action	Observe /Collect Method	Procedure	Transport Record	Begin Date	End Date
1	Whale, humpback	Central North Pacific Stock (NMFS Endangered)	Wild	All	Male and Female	4000	1	Harass	Survey, vessel	Acoustic, passive recording; Collect, sloughed skin; Observation, monitoring; Observations, behavioral; Photo-id; Photograph/Video; Underwater photo/videography	N/A	7/14/2010	7/31/2015
2	Whale, humpback	Central North Pacific Stock (NMFS Endangered)	Wild	All	Male and Female	300	1	Harass	Survey, vessel	Observation, monitoring; Photo-id; Photogrammetry; Photograph/Video; Underwater photo/videography	N/A	7/14/2010	7/31/2015
	Details: Photogrammetry												
3	Whale, humpback	Central North Pacific Stock (NMFS Endangered)	Wild	Adult/ Juvenile	Male and Female	300	1	Harass/Sampling	Survey, vessel	Observation, monitoring; Observations, behavioral; Photo-id; Photograph/Video; Sample, skin biopsy; Underwater photo/videography	N/A	7/14/2010	7/31/2015
4	Whale, humpback	Central North Pacific Stock (NMFS Endangered)	Wild	All	Male and Female	300	1	Harass	Survey, vessel	Acoustic, active playback/broadcast; Acoustic, passive recording; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Underwater photo/videography	N/A	7/14/2010	7/31/2015

5	Whale, humpback	Central North Pacific Stock (NMFS Endangered)	Wild	Adult	Male and Female	20	1	Harass/Sampling	Survey, vessel	Acoustic, passive recording; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Sample, skin biopsy; Underwater photo/videography	N/A	7/14/2010	7/31/2015
	Details: Burgess tag, critter cam or similar												
6	Whale, humpback	Central North Pacific Stock (NMFS Endangered)	Wild	Adult	Male and Female	20	1	Harass/Sampling	Survey, vessel	Acoustic, passive recording; Instrument, dart/barb tag; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Sample, skin biopsy; Underwater photo/videography	N/A	7/14/2010	7/31/2015
	Details: Andrews satellite tag												
7	Whale, killer	Range-wide	Wild	All	Male and Female	205	1	Harass	Survey, vessel	Incidental harassment	N/A	7/14/2010	7/31/2015
	Details: Non-endangered stocks only												

Location

Research Area: Pacific Ocean **State:** WA **Stream Name:** Coastal waters of Washington State **Latitude North:** 48 **Latitude South:** **Longitude East:** 125 **Longitude West:**
Location Description: Research may be conducted in all Washington State coastal waters, especially Straits of Juan De Fuca, Puget Sound and outside coast.

Take Information

Line	Ver	Species	Listing Unit/Stock	Production /Origin	Life Stage	Sex	Expected Take	Takes Per Animal	Take Action	Observe /Collect Method	Procedure	Transport Record	Begin Date	End Date
1		Whale, humpback	Eastern North Pacific Stock (NMFS Endangered)	Wild	All	Male and Female	200	3	Harass	Survey, vessel	Acoustic, passive recording; Collect, sloughed skin; Observations, behavioral; Photo-id	N/A	7/14/2010	7/31/2015
2		Whale, gray	Eastern North Pacific	Wild	All	Male and Female	200	3	Harass	Survey, vessel	Collect, sloughed skin; Observations, behavioral; Photo-id; Photograph/Video	N/A	7/14/2010	7/31/2015

NEPA Checklist

1) If your activities will involve equipment (e.g., scientific instruments) or techniques that are new, untested,or otherwise have unknown or uncertain impacts on the biological or physical environment , please discuss the degree to which they are likely to be adopted by others for similar activities or applied more broadly.

All activities proposed have been used in one form or another for 10-30 years. The lesser time period refers to tagging that has undergone major advances in last decade. Any tags (and tag attachment) used in this study will be the most "tried and true" types (as we are far more interested in gaining the information than testing a technique). I do not know if playback is considered controversial. It is a standard technique in wildlife behavior studies, used on humpbacks since the early 1980s. We have been permitted to conduct playbacks for last 5 years with no hint of controversy reaching us.

2) If your activities involve collecting, handling, or transporting potentially infectious agents or pathogens (e.g., biological specimens such as live animals or blood), or using or transporting hazardous substances (e.g., toxic chemicals), provide a description of the protocols you will use to ensure public health and human safety are not adversely affected, such as by spread of zoonotic diseases or contamination of food or water supplies.

The only collecting activities will be skin/blubber biopsy samples. I am not aware of any potential infectious agents or pathogens related to these. These samples are collected using biopsy dart, taken from dart head with forceps and placed in preservative tube and sent to laboratory. There will be no hazardous substances transported.

3) Describe the physical characteristics of your project location, including whether you will be working in or near unique geographic areas such as state or National Marine Sanctuaries, Marine Protected Areas, Parks or Wilderness Areas, Wildlife Refuges, Wild and Scenic Rivers, designated Critical Habitat for endangered or threatened species, Essential Fish Habitat, etc. Discuss how your activities could impact the physical environment, such as by direct alteration of substrate during use of bottom trawls, setting nets, anchoring vessels or buoys, erecting blinds or other structures, or ingress and egress of researchers, and measures you will take to minimize these impacts.

The Hawaii study area is within the Hawaiian Islands Humpback Whale National Marine Sanctuary. Our research activities have no impact on the physical environment, in Hawaii, Alaska or the Pacific Northwest.

4) Briefly describe important scientific, cultural, or historic resources (e.g., archeological resources, animals used for subsistence, sites listed in or eligible for listing in the National Register of Historic Places) in your project area and discuss measures you will take to ensure your work does not cause loss or destruction of such resources. If your activity will target marine mammals in Alaska or Washington, discuss measures you will take to ensure your project does not adversely affect the availability (e.g., distribution, abundance) or suitability (e.g., food safety) of these animals for subsistence uses.

Our work can not cause the loss of scientific, cultural or historic resources.

5) Discuss whether your project involves activities known or suspected of introducing or spreading invasive species, intentionally or not, (e.g., transporting animals or tissues, discharging ballast water, use of equipment at multiple sites). Describe measures you would take to prevent the possible introduction or spread of non-indigenous or invasive species, including plants, animals, microbes, or other biological agents.

The only activity that involves the transport of biological materials from one area to another is the transport of skin/blubber biopsy samples from study location to laboratory. The sample is placed in tube with preservative, sealed and transported to lab.

I suppose, moving of equipment from one location to another - e.g. Hawaii to Alaska and reverse could conceivably transport some types of microbe - but no more that the 1000s of people that travel between the locations annually.

Project Contacts

Primary Contact: Jim David Darling
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Email: darling@island.net

Principal Investigator: Jim David Darling

Other Personnel:

Name	Role(s)
Mark Ferrari	Co-Investigator
Deborah Glockner-Ferrari	Co-Investigator
Meagan Jones	Co-Investigator
Elizabeth Ann Mathews	Co-Investigator
Karen Miller	Co-Investigator
Flip Nicklin	Co-Investigator

Attachments

Application Archive - P13846T14Issued.pdf (Added Aug 2, 2010)
Certification of Identity - P13846T1113846 Jim Darling authentication.pdf (Added Jul 9, 2009)
Contact - Deborah Glockner-Ferrari: C7138T5D. Glockner-Ferrari CV.docx (Added Jan 26, 2011)

Contact - Elizabeth Ann Mathews: C12762T5Mathews CV 0902 PermitAppl.pdf (Added Feb 19, 2009)
Contact - Elizabeth Ann Mathews: C13271T5Mathews CV 090414 3YrActivityReport.pdf (Added Jul 7, 2009)
Contact - Flip Nicklin: C13270T5FN CV.doc (Added Jul 9, 2009)
Contact - Jim David Darling: C12137T5JD CV fuller.doc (Added Jul 7, 2009)
Contact - Mark Ferrari: C6447T5M. Ferrari CV.docx (Added Jan 26, 2011)
Contact - Meagan Jones: C13269T5MJ CV 2009.pdf (Added Jul 8, 2009)
Lit Review - P13846T7Permit Lit Review 1.doc (Added Jul 4, 2009)
References - P13846T12REFERENCES for AAP.doc (Added Jul 4, 2009)

Status

Application Status: Application Complete
Date Submitted: July 12, 2009
Date Completed: November 12, 2009
FR Notice of Receipt Published: November 11, 2009 **Number:** 0648-xs81
Comment Period Closed: December 14, 2009 **Comments Received:** Yes **Comments Addressed:** Yes
Last Date Archived: February 2, 2011

- **MMPA/ESA Research/Enhancement permit**

Current Status: Issued **Status Date:** July 14, 2010
Section 7 Consultation: Formal Consultation
NEPA Analysis: Environmental Assessment
Date Cleared by General Counsel: July 14, 2010
FR Notice of Issuance/Denial Published: July 23, 2010 **Notice Number:** 0648-xx69
Expire Date: July 31, 2015
Analyst Information:

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Modification Requests

Number	Title	Modification Requested Description	Status	Date Submitted	Date Issued	Issued Version

1	CI Authorization	Add 2 CIs: M. Ferrari and D. Glockner-Ferrari for level B research activities	Issued 01/26/2011	01/31/2011

Reports

Reports Required

Nbr	Report Type	Report Period		Date Due	Status	Date Received
		Start Date	End Date			
1	Annual	07/14/2010	07/31/2011	10/31/2011	N/A	
2	Annual	08/01/2011	07/31/2012	10/31/2012	N/A	
3	Annual	08/01/2012	07/31/2013	10/31/2013	N/A	
4	Annual	08/01/2013	07/31/2014	10/31/2014	N/A	
5	Annual	08/01/2014	07/31/2015	10/31/2015	N/A	
6	Final	07/14/2010	07/31/2015	01/31/2016	N/A	